A Watershed Conditions Report For the State of Kansas

HUC 10250017 (Lower Republican) Watershed

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Watershed Conditions Report
For
HUC 8 10250017 (Lower Republican)

Prepared by
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Nonpoint Source Section
01/03/01

EXECUTIVE SUMMARY

This Watershed Conditions Report is designed to serve as a water quality "atlas", and is intended to provide stakeholders in water quality with a tool to assess the quality of water resources within their watershed. Surface water quality for HUC 8 10250017 streams and rivers is generally fair to poor with over half of the surface water bodies not supporting their designated uses. The primary pollutant concern within HUC 8 10250017 streams and rivers is fecal coliform bacteria (FCB). FCB is found in the digestive systems of warm blooded animals. In the environmental coliform bacteria is an indicator of potential disease producing organisms. Other pollutant concerns are dissolved oxygen, chloride, and ammonia. Low DO levels typically coincide with an abundance of algae, which may be caused by excess nutrients. An abundance of algae causes the population of decomposers to increase, which in turn uses up the oxygen in the stream or river. Chloride is a naturally occurring mineral found in Kansas lakes, streams, and groundwater. In high concentrations, chloride can cause deterioration of domestic plumbing, water heaters, and municipal water works. Ammonia is a chemical which is toxic to fish and aquatic organisms.

Within Huc 10250017 there is one state park, several smaller city and county lakes, and two wetland areas. The primary pollutant concern for lakes within the watershed is eutrophication. Eutrophication is a natural process which creates conditions favorable for algae blooms and excess plant growth. This process is often accelerated by excess nutrient loading from the watershed. Additional pollutant concerns for lakes within the watershed include pH, silt, dissolved oxygen, fecal coliform bacteria, and excess biomass.

Groundwater resources in HUC 8 10250017 include alluvial aquifers of the Republican River and it's tributaries and portions of the Dakota and Glacial aquifers. Water from these aquifers is generally in good condition with naturally occurring minerals and nitrate as the primary pollutant concerns.

PURPOSE

The Watershed Conditions Report is designed to serve as a water quality "atlas" for a given watershed, and is intended to provide Watershed Stakeholders Committees (WSC) with a tool to assess the quality of water resources within their watershed.

BACKGROUND

The Clean Water Act mandated that States assess the quality of their waters and implement Total Maximum Daily Loads (TMDLs) for water bodies that do not meet their designated uses. The following is a summary of steps taken by the State of Kansas to comply with these requirements of the Clean Water Act.

The Kansas Department of Health and Environment (KDHE) prepared the Kansas Unified Watershed Assessment in 1998. This assessment classifies the State's watersheds into four categories. A Category I classification means the watershed is in need of restoration due to having water quality impairments or degradation of other natural resources related to an aquatic habitat, ecosystem health and other factors related to aquatic life resources. Category II are watersheds in need of protection. Category III are watersheds with pristine or sensitive aquatic system conditions on lands administered by federal, state, or tribal governments. Category IV watersheds are those for which there is insufficient data to make accurate classification. KDHE then assigned a restoration priority score to each Category I watershed.

As mandated by section 303(d) of the Clean Water Act, Lakes and streams within the Category I watersheds, which do not meet water quality standards, are published biannually in the 303(d) list. Subsequently, lakes and streams which appear on the 303 (d) list are scheduled to have a Total Maximum Daily Loads (TMDL) prepared. KDHE is currently preparing TMDLs for impaired stream segments located within the highest restoration priority watersheds.

To restore water quality within the Category I watersheds, KDHE recommends the implementation of a Watershed Restoration and Protection Strategy (WRAPS). The ultimate goal of the WRAPS process is to create and implement a plan to restore the health of water bodies that do not meet their water quality standards. Additionally, the WRAPS process will insure that water bodies that currently meet their water quality standards are protected.

KDHE recommends that the WRAPS process be implemented on a local level by a Watershed Stakeholders Committee (WSC). The WSC would have the responsibility of working with local and state agencies to develop a WRAPS plan. This plan should identify the following: public outreach methods; required monitoring activities based on water quality goals and outcomes; specific water quality problems; watershed coordinator/evaluator; actions to be taken to achieve water quality goals and outcomes; schedule for implementation of needed restoration measures; and funding needs.

Streams and Rivers

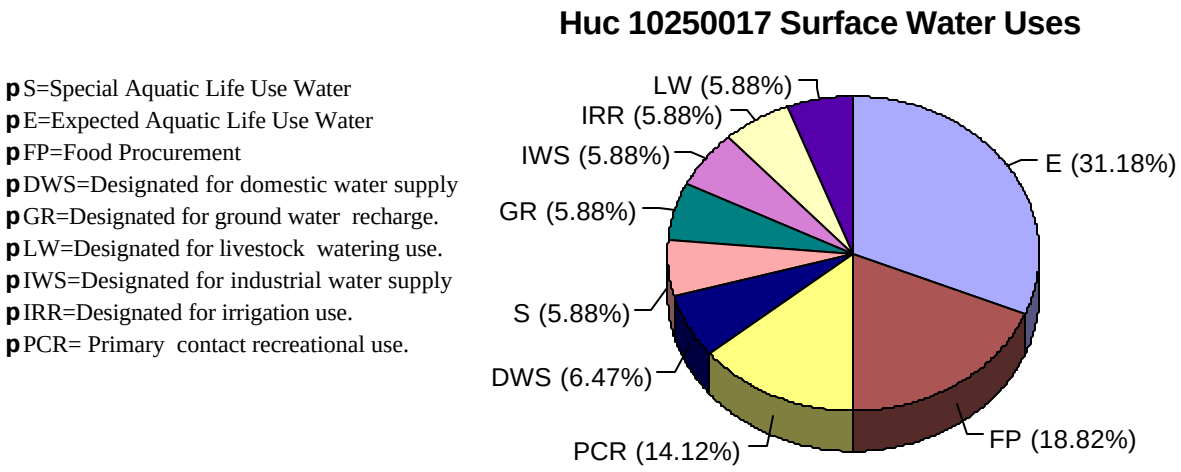
HUC 8 10250017

The Huc 8 10250017 watershed is ranked eleventh in priority for watershed restoration throughout the state. According to the Unified Watershed Assessment, approximately fifty-seven percent of the total miles of water in this watershed do not meet their designated uses. The Republican River, Buffalo Creek, Elk Creek, Marsh Creek, and Salt Creek are among the larger streams and rivers in this watershed. See Attachment 1 for a map of streams and rivers in HUC 8 10250017.

Designated Uses

This watershed contains one large river, the Republican River, and several smaller streams and creeks throughout the HUC area. There are 138 public water supplies within the watershed, many of which draw water from the Republican River and it's alluvium. According to the Kansas Surface Water Register, the most common designated uses for streams and rivers in this watershed include: expected aquatic life uses, food procurement, contact recreation, and domestic water supply.

Figure 1



TMDL/Contaminate Concerns

Streams and rivers throughout Kansas have been sub-divided into segments. By dividing the streams and rivers into segments they can be better analyzed and understood. A reach of river or stream may have segments which vary greatly in water quality, based on surrounding land uses. Figure 2 below displays the impairments of the streams and rivers based on the number of segments sampled.

Surface waters not meeting their designated uses will require total maximum daily loads (TMDL)s. Figure 2 shows that 54% of the stream/river segments sampled require TMDLs. Figure 3 shows that of those impaired segments, 67% are impaired by fecal coliform bacteria (FCB), 17% by dissolved oxygen (DO), 12% by chloride (CL), and 4% by ammonia (NH3).

FCB is the primary pollutant concern in the stream/river segments sampled in this watershed along with dissolved oxygen, chloride, and ammonia. Fecal coliform bacteria is a bacteria present in human and animal waste. It serves as an indicator of potential disease causing organisms. Low DO levels typically coincide with an abundance of algae, which may be caused by excess nutrients. An abundance of algae causes the population of decomposers to increase, which in turn uses up the oxygen in the stream or river. Chloride is a naturally occurring mineral found in Kansas lakes, streams, and groundwater. In high concentrations, chloride can cause deterioration of domestic plumbing, water heaters, and municipal water works. Ammonia is a chemical which is toxic to fish and aquatic organisms.

Figure 2

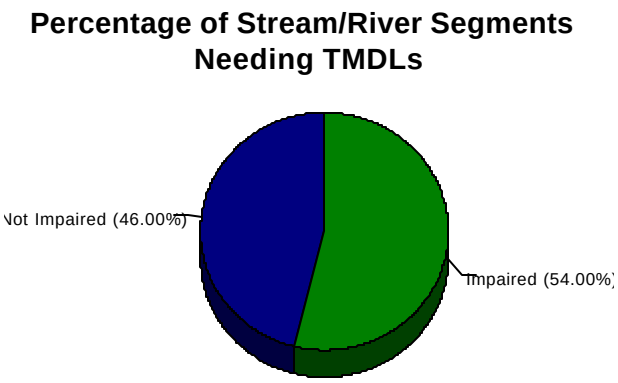
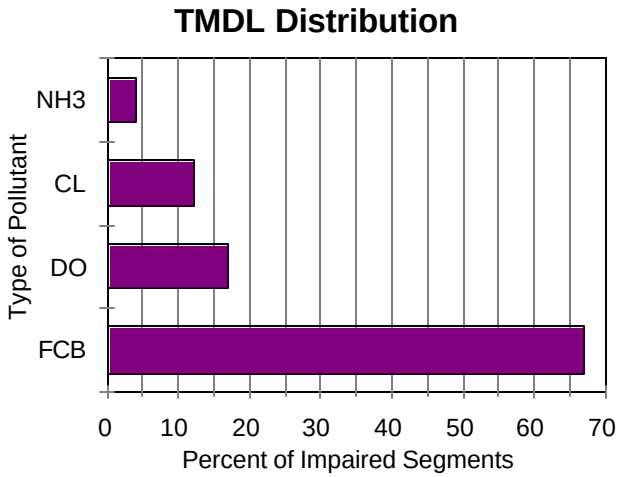


Figure 3



Land Uses

Analyzing the land uses within this watershed helps to understand which land uses might have greater influences on the source of the impairments. Below is a list of the land uses in this watershed. Grassland is considered grazingland for livestock.

- Urban Area.... .8%
- Row Crop....25%
- Grassland....67%
- Wooded area....5%
- Water area....2%
- Other.... .05%

Potential Pollution Sources

Potential sources of FCB contamination include feedlots, wastewater treatment facilities, septic systems, and wildlife. Potential sources of excess nutrients include registered feedlots, unregistered feedlots, wastewater treatment facilities, septic systems, wildlife, and grazingland. The primary of source of chloride impacted groundwater is intrusion of salt water from deeper formations. Potential sources of ammonia include livestock, septic tanks, fertilizer, municipal and industrial waste.

Feedlots: In Kansas, confined animal feeding operations (CAFOs) with greater than 300 animal units must register with KDHE. There are approximately 279 registered CAFOs located within HUC8 10250017 (this number, which is based on best available information, may be dated and subject to change). Waste disposal practices and waste water effluent quality are closely monitored by KDHE for these registered CAFOs to determine the need for runoff control practices or structure. Because of this

monitoring, registered CAFOs are not considered a significant threat to water resources within the watershed. A portion of the State's livestock population exists on small unregistered farms. These small unregistered livestock operations may contribute a significant source of fecal coliform bacteria and nutrients, depending on the presence and condition of waste management systems and proximity to water resources.

Wastewater Treatment Facilities: There are approximately 22 municipal and industrial wastewater treatment facilities within the watershed (this number may be dated and subject to change). These facilities are currently regulated by KDHE under National Pollutant Discharge Elimination System (NPDES) permits. These permits specify the maximum amount of pollutants allowed to be discharged to the "waters of the State". Due to the chlorination processes involved in municipal waste treatment, these facilities are not considered to be a significant source of fecal coliform bacteria; however they may be a significant source of nutrients.

Septic Systems: There are currently thousands of septic systems within the watershed and this number is increasing. When properly designed, installed, and maintained, septic systems can act as an effective means of wastewater treatment. However, poorly maintained or "failing" septic systems can leach pollutants into nearby surface waters and groundwater. The exact number of failing septic systems within the watershed is unknown; however the number may be increasing due to the current trends in suburban development. Local Environmental Protection Programs and county health departments provide excellent sources of information regarding the proper design, installation, and maintenance for septic systems.

Wildlife: Wildlife located throughout the watershed are not usually considered a significant source of nonpoint source pollutants. However, during seasonal migrations, concentrations of waterfowl can add significant amounts of fecal coliform bacteria and nutrients into surface water resources.

Row Crop Agriculture: As shown above, approximately 25% of the watershed's land is used for row crop agriculture. Row crop agriculture can be a significant source of nonpoint source pollution. Common pollutants from row crop agriculture include sediment, nutrients, pesticides, and fecal coliform bacteria. Many producers within the watershed regularly implement and maintain BMPs to limit the amount of nonpoint source pollutants leaving their farm. Some common BMPs include: the use of contour plowing; use of cover crops; maintaining buffer strips along field edges; and proper timing of fertilizer application.

Urban/Suburban Runoff: Many urban landscapes are covered by paved surfaces including roads, driveways, parking lots, and sidewalks. These surfaces are impermeable and tend to divert water into storm drains at high velocities. This increased flow velocity from urban areas can cause severe stream bank erosion in receiving water bodies. Additionally, urban and suburban runoff may carry other pollutants like petroleum hydrocarbons and heavy metals. Currently, the watershed is only about .8% urban. Limiting paved surfaces is the key to slowing urban nonpoint source pollution. The use of grass swales, open spaces, and storm water retention ponds are recommended to slow runoff in urban areas.

Lakes & Wetlands

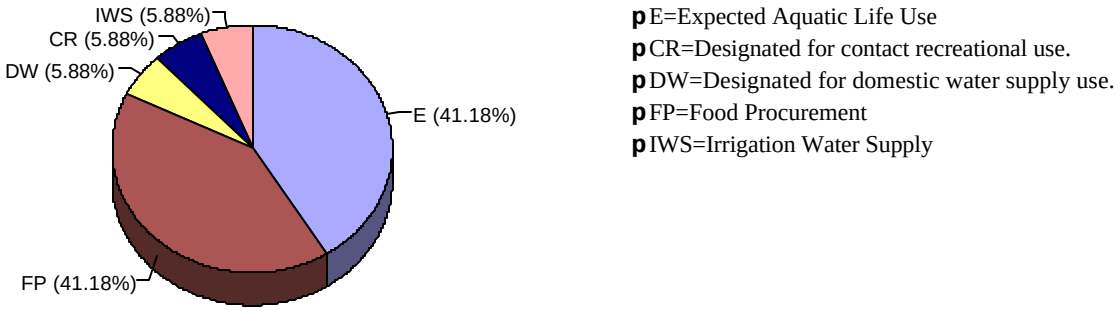
Huc 8 10250017 is the home to Milford Lake, Wakefield Lake, Lake Jewell, several smaller city and county lakes, as well as two wetland areas. Milford Lake is the state's largest lake with a 16,000 acre surface area and a 18,000 acre wildlife area. It is used for recreational purposes such as camping, fishing, swimming, and canoeing. See Attachment 2 for a map of lakes in HUC 8 10250017.

Designated Uses

The majority of the lakes in this watershed are designated for expected aquatic life use, food procurement, industrial water supply, domestic water supply, and contact recreation..

Figure 4

Lake Uses in 10250017



TMDL/Contaminate Concerns

Surface waters not meeting their designated uses will require total maximum daily loads (TMDL)s. Figure 5 shows that 43% of the lakes/wetlands in this watershed need TMDLs.

The primary pollutants for this watersheds' lakes and wetlands are eutrophication (E), excessive biomass (AP), silt, dissolved oxygen (DO), Fecal Coliform Bacteria (FCB), and pH. As shown below in Figure 6, approximately 38% of the lakes/wetlands in this watershed are eutrophic, and approximately 12.5% of the impaired lakes/wetlands do not meet their designated uses due to pH, siltation, FCB, dissolved oxygen, and excess biomass.

Eutrophication is a natural process which creates conditions favorable for algae blooms and excess plant growth. This process is often accelerated by excess nutrient loading from the watershed. Excessive biomass is an abundance of vascular plants that tends to be a nuisance and interferes with designated water uses. Low DO levels typically coincide with an abundance of algae, which may be caused by excess nutrients. An abundance of algae causes the population of decomposers to increase, which in turn uses up the oxygen in the water body. Silt loading is a result of erosion as the bare soil enters the lake and settles to the bottom. Silt decreases water clarity and eventually decreases water storage capacity. Silt also carries phosphorous into the reservoir, which can accelerate eutrophication. pH determines the alkalinity or acidity of water in the lake. If the water is too basic or acidic it can cause stress or kill the aquatic life and vegetation. Fecal coliform bacteria (FCB) is a bacteria present in human and animal waste. It serves as an indicator of potential disease causing organisms.

Figure 5

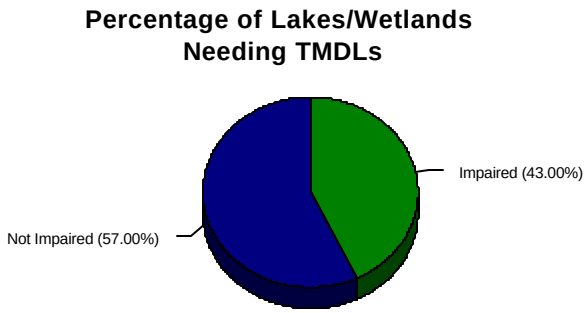
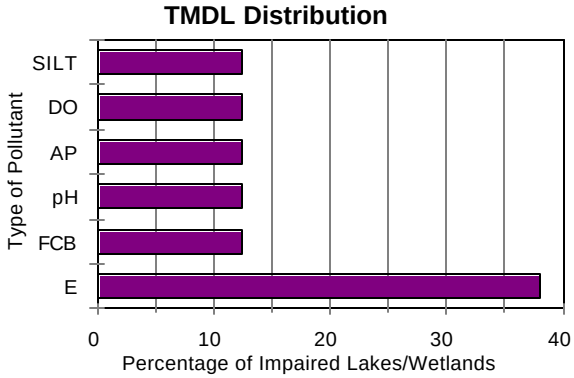


Figure 6



Potential Pollution Sources

Potential sources of sediment include construction sites, stream bank erosion, and row crop agriculture. Potential sources of excess nutrients include registered feedlots, unregistered feedlots, wastewater treatment facilities, septic systems, wildlife, and grazingland. Based on the watershed's land use percentages, the primary pollutant sources for nutrients would be row crop agriculture and grazingland. Additionally, feedlots, septic systems, and wastewater treatment facilities may contribute significant amounts of nutrients into the watershed.

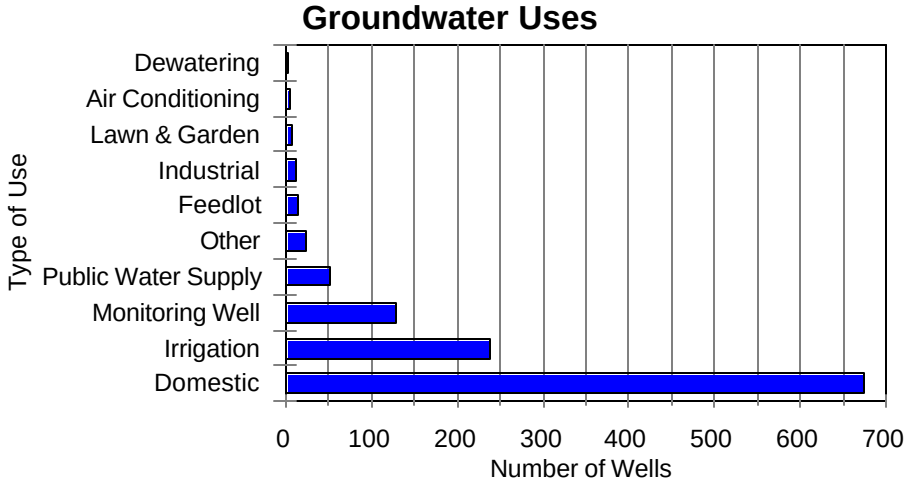
Groundwater

Major groundwater aquifers underlying this watershed include portions of the Glacial Drift, the Dakota, and Alluvial aquifers of the Republican River and it's tribuatries. See attachment 4 for a map of groundwater aquifers.

Designated Uses

There are approximately 1,159 groundwater wells located within the watershed. Water from these wells is used for domestic water supply, irrigation, monitoring wells, feedlots, and industrial use.

Figure 7



Aquifer Characteristics

Dakota Aquifer: Portions of the Dakota aquifer exist in the northwest portion of the watershed. Water from this aquifer is used for irrigation, public, and rural-domestic water supply. Water from this aquifer is high quality; however chloride and sodium content increase with depth.

Glacial Drift Aquifer: Portions of the Glacial Drift aquifer exist in the eastern portion of the counties bordering this watershed. Water from this aquifer is often used for rural domestic water supply. Historically, water from this aquifer is very hard with nitrates being one of the primary pollutant concerns.

Alluvial Aquifer: Alluvial aquifers of the Republican River exist throughout the watershed. Alluvial aquifers provide the primary water source for many public water supplies located within the watershed. Water quality in alluvial aquifers is generally good; however nitrates, minerals, pesticides, and bacteria can be pollutant concerns.

Potential Pollution Types and Sources

Common groundwater pollutants include: nitrates, chloride, sulfates, bacteria and atrazine. Nitrate impaired groundwater is perhaps the most prevalent groundwater contamination problem in the State.

Nitrate: Nitrate is a naturally occurring compound and is an essential component of all living matter. However, high concentrations of nitrate in drinking water can cause adverse health effects including "blue baby" syndrome. Sources of nitrate include municipal waste water treatment plant discharges, runoff from livestock operations, leaching of fertilizer from urban and agricultural areas, and failing septic systems.

Chloride: Chloride is a naturally occurring mineral found in Kansas lakes, streams, and groundwater. In high concentrations, chloride can cause deterioration of domestic plumbing, water heaters, and municipal water works. The primary source of chloride impacted groundwater is intrusion of salt water from deeper formations, often due to improperly constructed water wells which allow confined aquifers to come into contact with each other.

Sulfates: Sulfate is a naturally occurring mineral that can cause taste and odor problems in drinking water. Sulfates are dissolved into groundwater as the water moves through various sulfur containing rock formations.

Bacteria: Fecal coliform bacteria are found in the digestive systems of warm blooded animals. In the environment coliform bacteria is an indicator of potential disease causing organisms. Potential sources of bacteria contamination in groundwater include livestock facilities, septic systems, pets, and wildlife. Many wells are impacted by bacteria due to improper construction which allows water from the surface to funnel directly into the well.

Ammonia: Ammonia is a chemical which is toxic to fish and aquatic organisms. Sources of ammonia are livestock, septic tanks, fertilizer, municipal and industrial waste.
TSS: TSS stands for Total Suspended Solids which are particles such as soil, algae, and finely divided plant material suspended in water. Sources of TSS are soil erosion from cropland, stream banks, or construction sites, and municipal and industrial waste.

VOCs: Volatile organic compounds, also called purgeable organics, are components of fuels and solvents. They are ingredients in many household and industrial products. Sources of VOCs are leaking fuel storage tanks, trash dumps, and some agricultural pesticides.

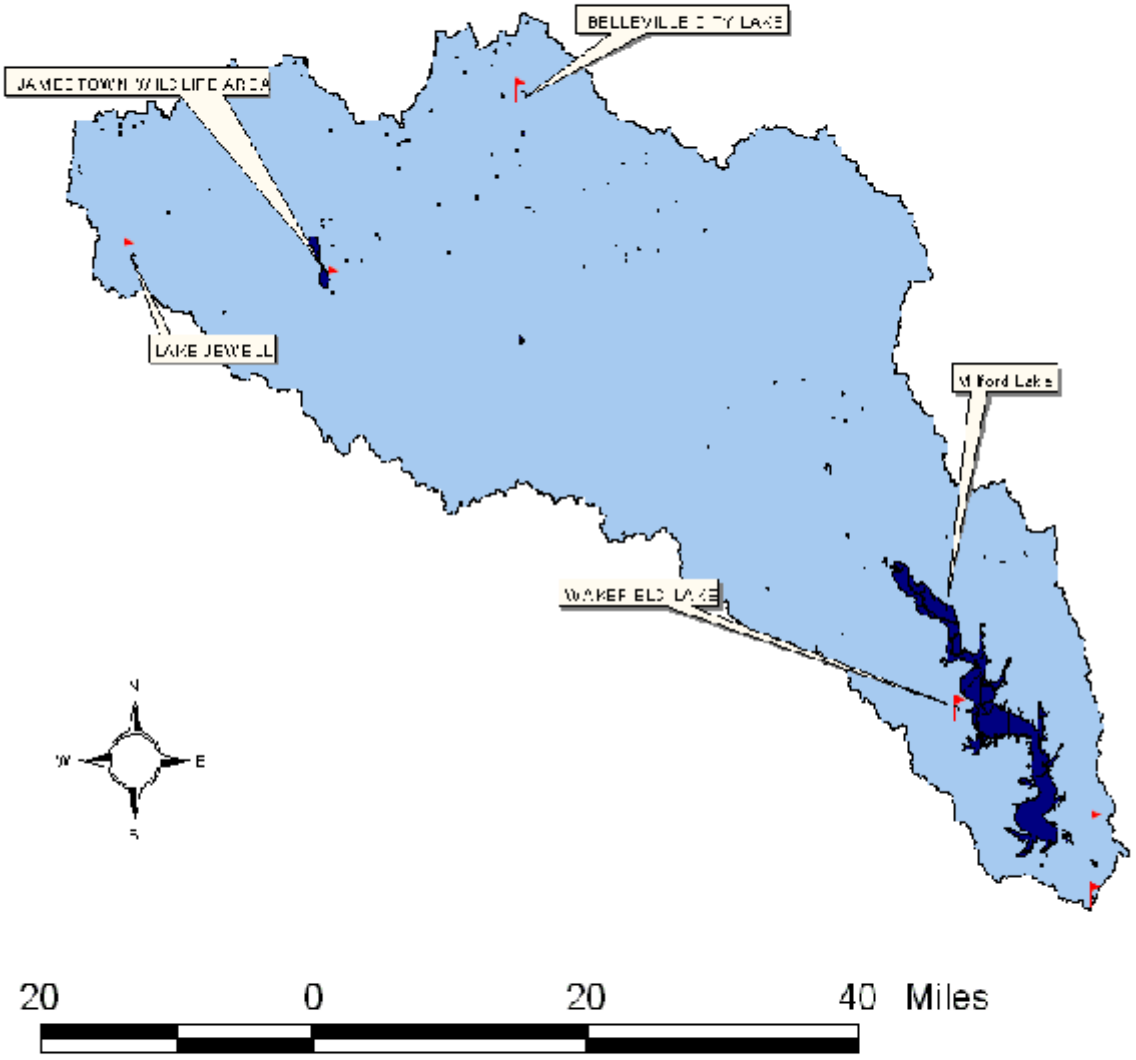
Iron: Iron is a naturally occurring element found in the soil throughout Kansas. It is an annoyance as it has an objectionable taste, causes a red stain to porcelain fixtures and laundry, and causes plumbing irritations.

Manganese: Manganese is a naturally occurring element and causes an unpleasant taste in drinking water, stains porcelain and laundry, and collects deposits in plumbing. It is naturally occurring throughout the soils in the state.

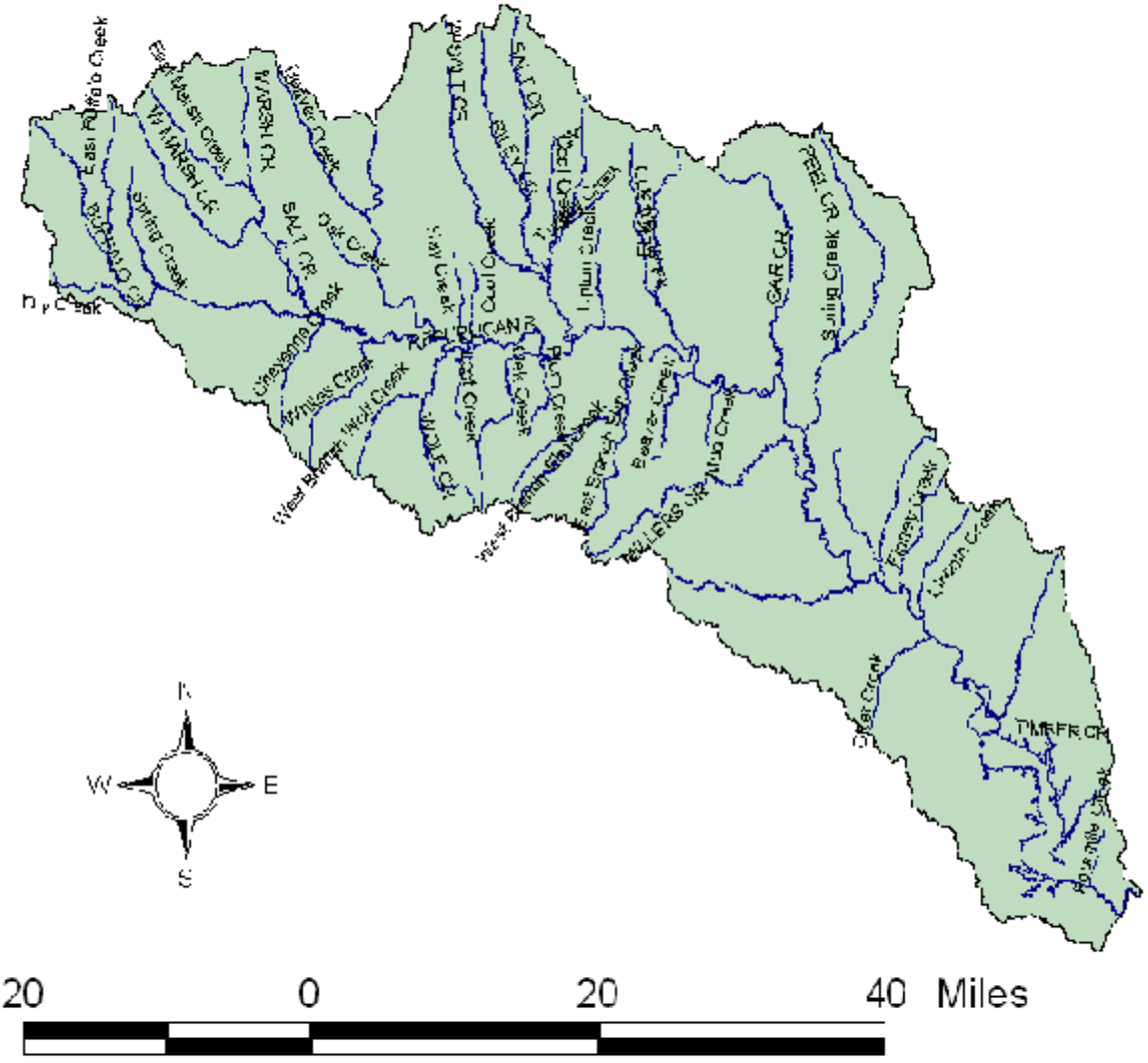
Attachment 1

Maps

Huc -10250017- Lower Republican Lake Monitoring Sites



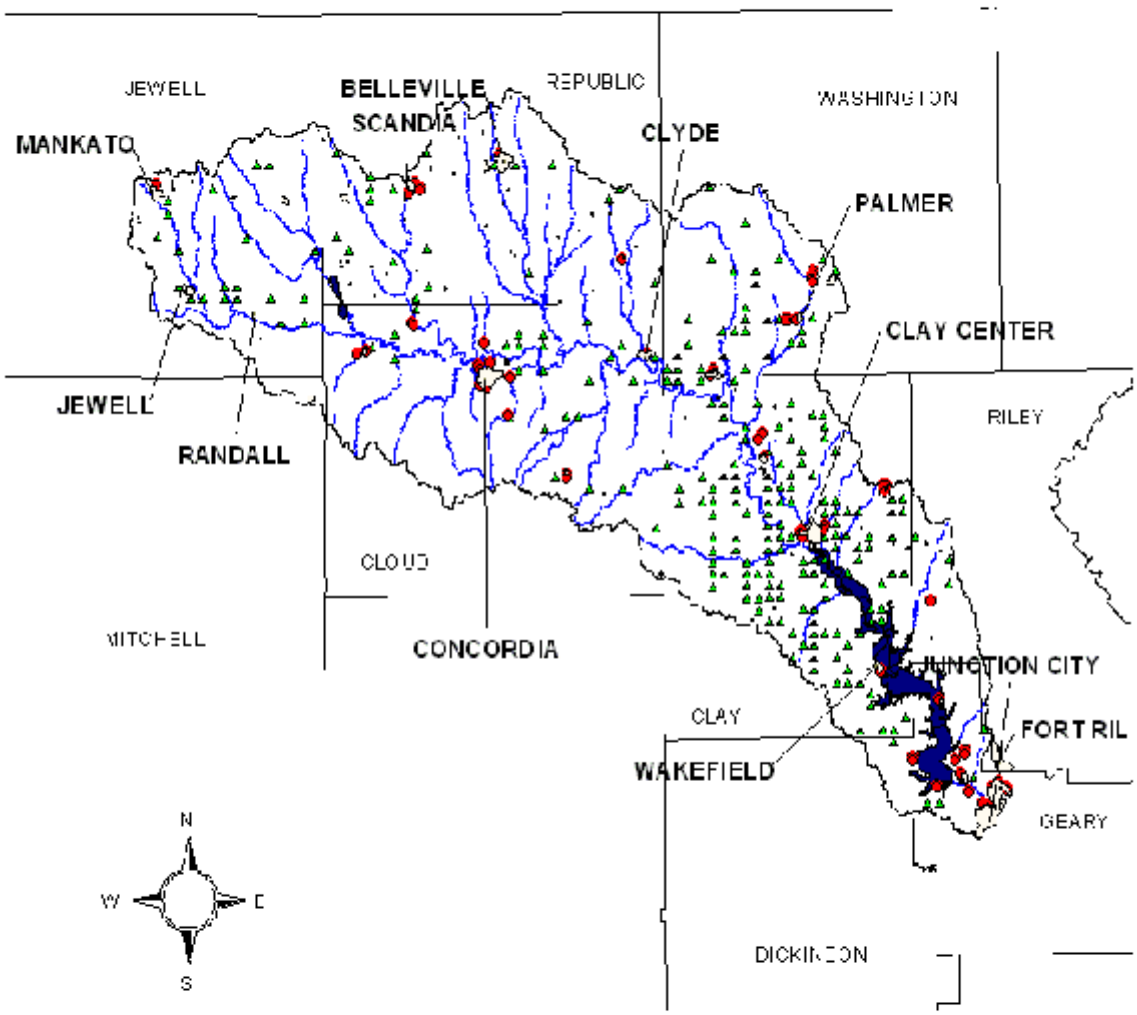
Huc -10250017- Lower Republican Streams & Rivers



Streams & Rivers

Huc 10250017

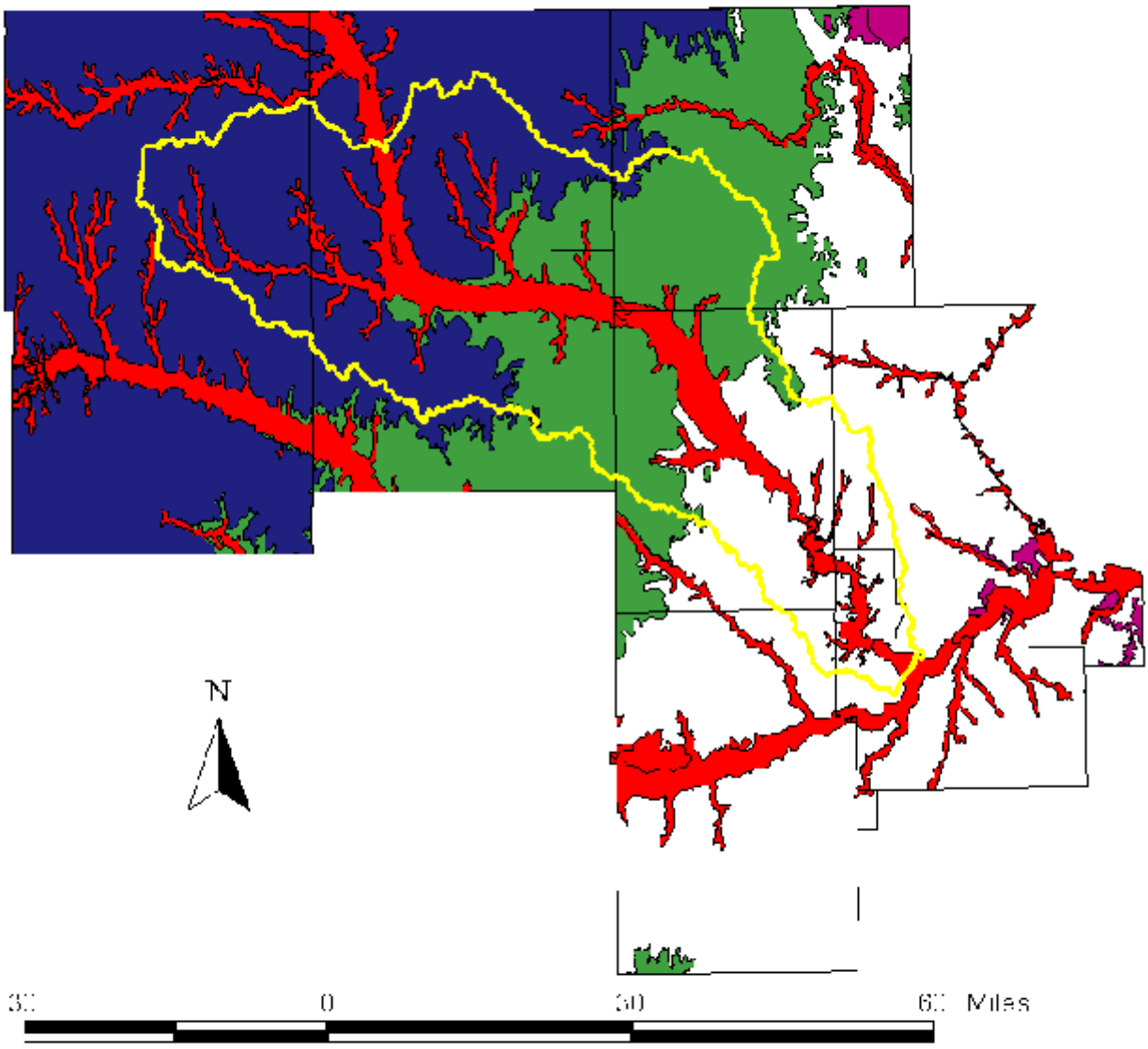
Huc -10250017- Lower Rupublican Watershed Boundary



Cities
Public Water Supplies
Feedlots
Lakes
Streams & Rivers
County Boundary
Huc 10250017

0 30 Miles

Huc 8 10250017 Lower Republican Groundwater Aquifers



Watershed Boundary
County Boundary
Glacial Aquifer
Alluvial Aquifer
Dakota Unconfined Aquifer
Dakota Confined Aquifer

KDHE
Bureau of Water
19 November 2001
Jaime Zoconis